## REMARKS

Claims 1 and 11 have been amended to include the limitation that the application of pressure to the brake cylinders is controlled so as to substantially evenly distribute braking energy to all of the vehicle wheels while preventing wheel slide and to minimize the variation of the wheel temperatures during braking.

Basis for this amendment can be found on page 16, lines 10-17 of the application. No new matter has been added.

## ARGUMENTS

Claims 1-3, 5-8, 11 and 16-17 are rejected under 35 USC 103(a) as being obvious over Cook et al (5,605,387) in view of Fourie (4,671,576).

It is the Examiner's position that Cook et al discloses a brake energy balancing system for a train which includes preprogramming information into a computer and using this information to brake the train. Please note that Cook et al is directed to a magnetic levitation train. The Examiner acknowledges that Cook et al fails to teach that the pre-selected information includes velocity dependence of wheel to rail adhesion. The Examiner then relies upon Fourie as teaching the use of pre-selected information including velocity dependence of wheel to rail adhesion. The Examiner then states that it would have been obvious to use the adhesion information of Fourie in the invention of Cook et al because knowing the adhesion characteristics help to

calculate a limit of the brake demand signal to prevent unwanted slip.

The Examiner further rejects Claims 9-10 and 12-15 under 35 USC 103(a) as being obvious over Cook et al in view of Fourie (4,671,576) and Kull (5,681,015); Claim 18 under 35 USC 103(a) as being unobvious over Cook et al in view of Fourie (4,671,576) and Matsuoka (5,544,057); and Claims 19-20 under 35 USC 103(a) as being unobvious over Cook et al in view of Fourie (4,671,576) and Roselli et al (5,718,487).

The Applicant disagrees with the Examiner's rejections for the following reasons.

Claims 1 and 11 have been amended to include the limitation that the application of pressure to the brake cylinders is controlled so as to substantially evenly distribute braking energy to all of the vehicle wheels while preventing wheel slide and minimizing the variation in wheel temperatures. During braking of a railway vehicle, it is important to have even brake shoe forces in order to dissipate the large amounts of energy which occur during braking of the vehicle. By evenly distributing the energy to all of the wheels, the chances of damaging any one wheel or wheel set is minimized. This helps not to slide any one axle set and shares the necessary retardation forces to minimize variation in wheel temperatures. This becomes a critical point when

attempting to improve stopping performance through the application of higher mechanical shoe forces.

The mechanical design modifications according to the present invention offers great performance benefits when integrated into ECP brake systems. Stop distances of entire trains can be reduced by virtually simultaneous application of the brake throughout the train. Slack and in train forces can be regulated by controlling brake applications in different portions of the train.

As stated in the previous responses, none of the art of record is concerned with the wheel to rail adhesion or the dissipation of the braking energy to avoid damaging of the railway vehicle wheels as specifically recited in the claims.

Furthermore, as stated in previous Amendments, both claims 1 and 11 are specifically directed to a method and apparatus for achieving a minimum stopping distance of a ***freight train consist***. The claims also specifically require that the ***rail to wheel adhesion*** is a significant factor in achieving this minimum stopping distance and that significant detrimental wheel slide should be avoided. The claims also specifically state that the velocity dependence of wheel to rail adhesion must be considered when determining the maximum pressure to be applied to the brake cylinders to stop the train consist.

In the Office Action, the Examiner relies upon the teachings of Cook et al as the primary reference in showing a method and

apparatus for achieving a minimum stopping distance of a freight train consist without incurring any significant detrimental wheel slide. The Applicant disagrees with this rejection as Cook et al is directed to a brake energy balancing system for magnetic levitation trains-see col. 1, lines 26+ and col. 2, lines 17-19. Cook et al fails to state or even suggest that the brake energy balancing system disclosed therein could be converted for use with a freight train consist.

Cook et al. includes no reference whatsoever to a freight train consist nor to the use of rails upon which the train runs upon or "brakes" upon. Also, please note that portions of the Examiner's Office Action when discussing Cook et al make reference to the movement of the wheels against a rail surface. See for example in paragraph 2 where the Examiner states "determining in the computer a pressure that can be applied to the brake cylinders that will maintain maximum adhesion between the wheels and the rail surface". This statement is misleading as Cook makes no reference to a relation between the wheels and a rail surface because mag-lev trains do not run along rails. It is Applicant's position that the present invention is not suggested nor rendered obvious by the teachings of Cook et al.

Claim 1 specifically recites in subparagraphs (a) and (c) that a computer is disposed on a freight locomotive. Subparagraph (d) of claim 1 requires maximum adhesion between wheels being braked and

rail surfaces in contact with the wheels. Claim 11 includes similar limitations to a freight train locomotive and/or freight car in subparagraphs (a), (b), and (c). These limitations recited in the claims are clearly not taught or suggested by Cook et al.

Furthermore, since the mag-lev train of Cook et al. does not run along a rail as does the present invention, Cook et al makes no reference to the use of velocity dependence of wheel to rail adhesion when determining the maximum amount of pressure to be applied to the brake cylinders to achieve stopping of the train while preventing wheel slide with respect to the rails. This is a significant element when determining the maximum amount of pressure to be applied to the brake cylinders. The present application discusses the importance of this element throughout the specification-see pages 11, 16-17 and charts 1-7. Also, Cook et al are not concerned with the dissipation of the braking energy through the even application of braking pressure to the cylinders so as to minimize the variation in temperatures of the wheels and to prevent damage to the wheels and/or wheel sets caused by sliding of one or more wheels with respect to the rail.

The Examiner's attention is also directed to page 16, lines 10-17 of the specification which discuss the need to minimize variation in wheel temperatures and the need to avoid sliding any one wheel or wheel set along the rails. None of these above

discussed factors are considered in Cook et al. because the mag-lev train of Cook et al. does not run or brake along a rail.

The Examiner relies upon the teachings of Fourie as teaching the use of pre-selected information including velocity dependence of wheel to rail adhesion in controlling the deceleration of the train by appropriately blending pneumatic braking pressure along with electrical control of the braking system. The Examiner states that it would have been obvious to one having ordinary skill in the art at the time of the invention to use the adhesion information of Fourie in the invention of Cook et al because knowing the adhesion characteristics help to calculate a limit to the brake demand signal to prevent unwanted slip. It is the Applicant's position that the combination of Fourie in the Cook et al invention is flawed as one having ordinary skill in the art would not use wheel to rail adhesion characteristics in the Cook et al system as a mag-lev train does not run along a rail. Thus, such information would be useless in determining the maximum amount of pressure to be applied to the brake cylinders to stop the train consist in a shortest possible distance while preventing wheel slide along the rail.

In the "Response to Arguments" section of previous Office Actions, the Examiner states that "The variables for such things as wheel adhesion would be different between a road and rail, but the systems would still operate the same". The Applicant disagrees.

The mag-lev train of Cook et al. does not brake while the train is running along a rail, but rather is similar to an airplane touching down on a runway, i.e. a planar surface. The Examiner's attention is directed to col. 4, lines 30+ of the reference which discuss the use of a signal indicating whether or not a wheel is locked during touchdown of the wheels and providing a hydroplaning detection signal to guard against hydroplaning of a wheel on touchdown at high speeds. Thus, it is not seen by Applicant how the teachings of Cook et al. can be concerned with the rail to wheel adhesion and minimizing wheel slide during braking as required by the claims when the train does not run along, nor is it braked while running along a rail.

In the Office Action dated December 20, 2002 the Examiner states that Cook et al discloses using his invention on other types of trains or the like. The Examiner concludes from this statement that such would include freight trains. The Applicant disagrees as mag-lev trains and railway trains have numerous differences and operate in entirely different manners as pointed out above. As discussed in detail above, the forces which act upon the wheels in mag-lev vehicles and those which act upon railway vehicles are vary greatly. Additionally, the braking systems of mag-lev trains are very different than the braking systems of railway trains. Considering the number of variables involved, one having ordinary

skill in the art would not look to the teachings of Cook et al to determine a braking system for a railway freight vehicle.

Accordingly, the Examiner is respectfully requested to withdraw the final rejection of claims 1-3, 5-8, 11 and 16-17 under 35 USC 103 (a) as Cook et al. as modified by Fourie fails to render the limitations of the claims obvious.

Additionally, Applicant respectfully requests withdrawal of the various 35 USC 103(a) rejections over claims 9-10, 12-15 and 18-20 as Cook et al as modified by Fourie and in combination with the cited references fail to render these claims obvious.

**CONCLUSION**

In view of the foregoing arguments and amendments, Applicant believes that the application meets all applicable statutory and regulatory requirements. Accordingly, Applicant respectfully requests entrance of the above amendment and allowance of all claims remaining in the application.

If the Examiner has any questions regarding this amendment

and/or believes that a telephone interview would assist in the advancement of this case to allowance, he/she is invited to contact the undersigned Agent for Applicant.

Respectfully submitted,

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***APPENDIX A***

1. (Twice Amended) A method of substantially achieving a minimum stopping distance of a freight train consist without incurring any significant detrimental wheel slide, said method comprising the steps of:

(a) preprogramming preselected information into a computer disposed on a freight locomotive including velocity dependence of wheel to rail adhesion;

(b) determining a speed of such freight train consist;

(c) communicating a signal that is indicative of said speed determined in step (b) to such computer disposed on such freight locomotive;

(d) determining in such computer a pressure that can be applied to brake cylinders which will maintain substantially maximum adhesion between wheels being braked and rail surfaces in contact with such wheels such that braking energy is substantially evenly distributed to all of such wheels;

(e) communicating a signal representative of such pressure determined in step (d) to a pressure control valve in fluid communication with such brake cylinders; and

(f) using said velocity dependence of wheel to rail adhesion in maintaining a maximum pressure on such brake cylinders that will stop such train consist in a shortest possible distance while simultaneously substantially preventing wheel slide <u>along said</u>

rails, minimizing variation in wheel temperatures, and substantially evenly distributing braking energy to all of such wheels.

11. (Twice Amended) An apparatus for substantially achieving a minimum stopping distance of a freight train consist without incurring any significant detrimental wheel slide, said apparatus comprising:

(a) a program having preselected information including velocity dependence of wheel to rail adhesion disposed in a computer disposed on a freight locomotive;

(b) a speed sensing means disposed on at least one of such locomotive and a freight car for determining a speed of such freight train consist;

(c) a means connected to said speed sensing means for communicating a signal that is indicative of said speed to such computer disposed on such freight locomotive, so that such program can determine a pressure that can be applied to brake cylinders which will maintain substantially maximum adhesion between wheels being braked and rail surfaces in contact with such wheels and substantially evenly distribute braking energy to all of such wheels; and

(d) a means connected to such computer for communicating a signal representative of such pressure determined by said program

to a pressure control valve disposed in fluid communication with such brake cylinders and maintaining a maximum pressure on such brake cylinders that will stop such train consist in a shortest possible distance while simultaneously substantially preventing wheel slide along said rails, minimizing variation in wheel temperatures, and substantially evenly distributing braking energy to all of such wheels.